

CLAIMS

1. A condensation heat exchanger, associated with a gas or fuel-oil burner (6), which comprises at least one tube bundle (2) through which a fluid to be heated, in particular cold water, circulates and which is mounted inside a gas-impermeable jacket (1), said tube bundle (2) being exposed to hot gases generated by the burner (6), while the jacket (1) has a flue-gas evacuation sleeve (122), characterized in that said jacket (1) has a wall portion having the configuration of a compartment (11, 12) accommodating a gas/air heat exchanger/recuperator (9) capable of recovering some of the heat conveyed by the flue gases leaving the tube bundle (2) and channeled toward the exit sleeve (122) in order to transfer it to air captured outside the exchanger, means such as a fan (V) also being provided in order to transfer the air heated by said gas/air heat recuperator (9) to the entrance of said burner (6).

2. A condensation heat exchanger, associated with a gas or fuel-oil burner (6), which comprises two coaxial tube bundles (2a, 2b) placed end-to-end, one of which acts as primary exchanger and the other of which acts as secondary exchanger, each of these bundles consisting of a tube or of a group of tubes arranged end-to-end, forming a helical coil, in which the wall of the tube(s) is produced from a material that is a good conductor of heat and has a flattened, oval cross section, the major axis of which is perpendicular or approximately perpendicular to the axis (X-X') of the helix, while the width of the gap separating two adjacent turns is constant and, particularly, smaller than the thickness of said cross section, said bundles (2a, 2b) being mounted securely inside a gas-impermeable jacket (1), means being provided in order to circulate at least one fluid to be heated, in

particular cold water, inside the tube(s) forming said bundles (2a, 2b), said jacket (1) having a burnt-gas-evacuation sleeve (122), the exchanger being arranged such that the hot gases generated by the burner (6) flow radially, or approximately radially, through said bundles, passing through the gaps separating its turns, a deflection plate (7) also being interposed between these two bundles and arranged in such a manner that the hot gases generated by the burner first flow through the primary exchanger (2a), flowing through the gaps separating its turns from the inside to the outside, then the secondary exchanger (2b), flowing through the gaps separating its turns from the outside to the inside, after which they are evacuated to the outside via said sleeve (122), characterized in that said jacket (1) has a wall portion having the configuration of a compartment (11, 12) and in that the condensation exchanger is provided with an additional gas/air heat exchanger/recuperator (9) that is inserted inside said compartment (11, 12) and is adapted for recovering some of the heat conveyed by the still-hot gases circulating between the secondary exchanger and the exit sleeve (122) and transferring it to air captured outside the exchanger, means such as a fan (V) also being provided in order to transfer the air heated by this gas/air heat recuperator (9) to the entrance of said burner (6).

3. The heat exchanger as claimed in claim 1 or 2, characterized in that said compartment consists of a substantially flat pocket that extends vertically and is open at its top and bottom ends, said gas/air heat exchanger/recuperator (9) being inserted in this compartment.

4. The heat exchanger as claimed in claim 3, characterized in that said gas/air heat exchanger/recuperator (9) includes two series of metal-walled adjacent, alternating vertical tubes

(90-900), namely a first series (90) allowing the passage of the still-hot gases circulating between the secondary exchanger and the exit sleeve (122) and a second series (900) allowing the passage of the outside  
5 air to be heated.

5. The heat exchanger as claimed in claim 4, characterized in that said tubes (90, 900) have a flattened cross section and are adjacent via their  
10 faces corresponding to the larger sides of this cross section.

6. The heat exchanger as claimed in claim 5, characterized in that said gas/air heat  
15 exchanger/recuperator (9) is produced from a single, concertina-folded sheet of metal.

7. The heat exchanger as claimed in one of claims 3 to 6, characterized in that one of said series of  
20 vertical tubes (900) is open at the top and bottom, allowing the top-to-bottom passage of the outside air to be heated, while the other series of vertical tubes (90) opens out inside the jacket (1) via entry (120) and exit (121) openings for the flue gases made in the  
25 wall (12) of the compartment, in its base and in its upper part, respectively.

8. The heat exchanger as claimed in one of the preceding claims, characterized in that said gas/air  
30 heat exchanger/recuperator (9) is removable and may easily be taken out of the compartment, particularly so that it can be washed.

9. The heat exchanger as claimed in claim 8,  
35 characterized in that said gas/air heat exchanger/recuperator (9) firstly has the configuration of a substantially parallelepipedal rectangular cassette that can be pushed into the compartment by means of translation from top to bottom, this cassette

being provided with a rigid tubular casing (8) of rectangular cross section, open at its lower and upper ends, and secondly includes two series of metal-walled adjacent, alternating vertical tubes (90-900), namely a  
5 first series (90) allowing the passage of the flue gases and a second series (900) allowing the passage of the outside air to be heated, these tubes being arranged hermetically inside said casing (8), suitable  
10 windows (80, 81) made in a larger face of the casing, in its base and in its top part, allowing, respectively, the entry and the exit of the flue gases in the first series of tubes (90).

10. The heat exchanger as claimed in claims 7 and 9  
15 taken in combination, characterized in that said bottom (80) and top (81) windows are dimensioned and positioned such that one is opposite the entry opening (120) and the other is opposite the exit opening (121) for the flue gases made in the wall (12) of the  
20 compartment, when the cassette is fully inserted inside said compartment.

11. The heat exchanger as claimed in claim 10, characterized in that said cassette is equipped in its  
25 base with a peripheral seal (95) capable of guaranteeing its leaktightness in the bottom of the compartment.

12. The heat exchanger as claimed in one of claims 9  
30 to 11, characterized in that said casing is provided in its upper part with a peripheral rim (82) capable of ensuring that it bears and/or is fixed against the upper edge of the compartment.

35 13. The heat exchanger as claimed in one of claims 9 to 12, characterized in that said gas/air heat exchanger/recuperator (9) includes a pair of plates (93, 93') in the form of grilles having solid areas that are fixed by nesting and adhesive bonding to the

upper and lower edges of the two series of tubes (90-900) such that they block off those of the first series (90) receiving the flue gases, these solid areas being separated by slits that form the mouths of the  
5 tubes of the second series (900) that allow the passage of the outside air to be heated.

14. The heat exchanger as claimed in one of the preceding claims, characterized in that the bottom of  
10 the unit has orifices (130, 110) for recovering and evacuating the condensates generated both by the condensation of the flue gases and by the condensation of the combustion air inside the gas/air heat exchanger/recuperator (9).

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15. A removable gas/air heat exchanger/recuperator designed for equipping a heat exchanger as claimed in one of claims 9 to 14.